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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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**Declaration under Rule 4.17:**

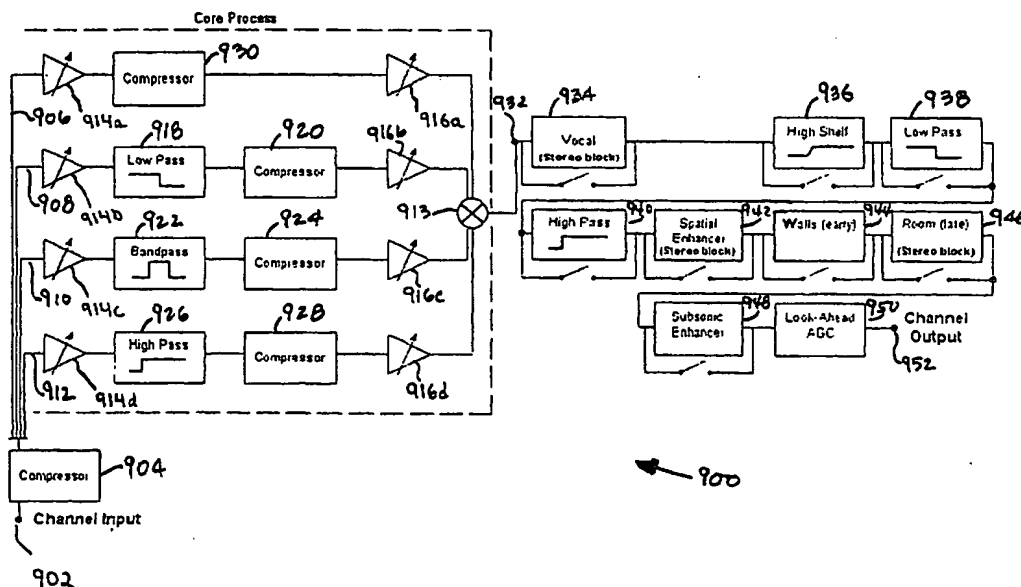
— of inventorship (Rule 4.17(iv)) for US only

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[Continued on next page]

(54) Title: ACOUSTICAL VIRTUAL REALITY ENGINE AND ADVANCED TECHNIQUES FOR ENHANCING DELIVERED SOUND



(57) Abstract: Techniques and systems for enhancing delivered audio signals are disclosed which may be employed in a delivery system at a server side, a client side, or both. The techniques include forming a processed audio signal by processing audio signals through multiple pathways which operate on different frequency bands using dynamic processing and other elements, and thereafter providing recording or listening environment enhancements and other sound enhancements to the processed audio signal. Also disclosed are techniques and systems for implementing the multi-pathway processing and environmental and sound enhancements.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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3/00, G10K 15/12, H04R 29/00, 5/04

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CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,  
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,  
VC, VN, YU, ZA, ZM, ZW.

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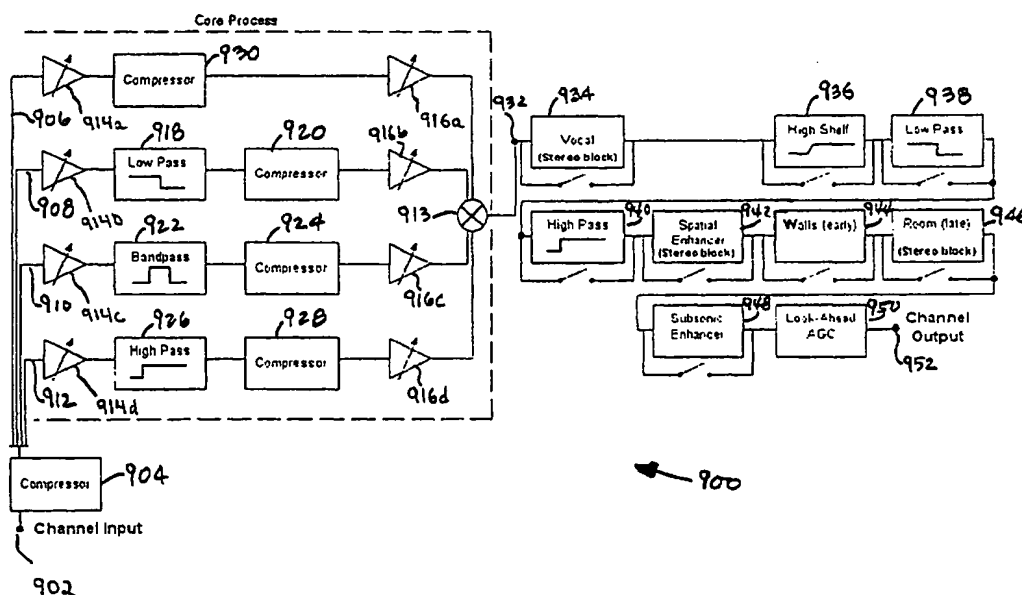
(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **PADDOCK,**

[Continued on next page]

(54) Title: **ACOUSTICAL VIRTUAL REALITY ENGINE AND ADVANCED TECHNIQUES FOR ENHANCING DELIVERED SOUND**



(57) Abstract: Techniques and systems for enhancing delivered audio signals are disclosed which may be employed in a delivery system at a server side, a client side, or both. The techniques include forming a processed audio signal by processing audio signals through multiple pathways which operate on different frequency bands using dynamic processing and other elements, and thereafter providing recording or listening environment enhancements and other sound enhancements to the processed audio signal. Also disclosed are techniques and systems for implementing the multi-pathway processing and environmental and sound enhancements.



**Declaration under Rule 4.17:**

- *of inventorship (Rule 4.17(iv)) for US only*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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25 November 2004

# INTERNATIONAL SEARCH REPORT

International Publication No.

PCT/US03/17788

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H03G 9/00, 7/00, 3/00; G10K 15/12; H04R 29/00, 5/04

US CL : 381/106, 103, 61, 63, 59, 98, 1, 303; 700/94

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 381/106-108, 101-103, 61, 63, 59, 98, 1, 303; 700/94; 704/500; 375/254; 333/14; 455/72

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Google Internet search. Search terms: compressor, bands, pre-emphasis, time beat, dynamics.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,633,483 B1 (TAKAHASHI et al.) 30 December 1986 (30.12.1986); Fig. 9A; column 7, lines 44-53; column 27, lines 7-23.	1-5
X	US 3,539,725 B1 (HELLWARTH et al.) 10 November 1970 (10.11.1970); the entire document.	27-32
—		6-11, 15-18
Y	US 6,091,824 B1 (LIN et al.) 18 July 2000 (18.07.2000); the entire document.	
—		6-11, 15-21, 23, 25, 26, 33, 34
Y	DAVIES, J. et al. 'Squeeze Me, Stretch Me: The DC 24 Users Guide' [online] Rane Corporation, 1993 [retrieved on 2004-08-24]. Retrieved from the Internet: <URL: <a href="http://www.rane.com/pdf/note130.pdf">http://www.rane.com/pdf/note130.pdf</a> > . Fig. 1; pages 3-5.	19-21, 23, 25, 26, 33, 34
—		
Y	US 5,420,929 B1 (GEDDES et al.) 30 May 1995 (30.05.1995), the entire document.	26, 34
—		
Y		



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

PCT/US03/17788

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,628,530 B1 (OP DE BEEK et al.) 09 December 1986 (09.12.1986); the entire document.	12-14

# INTERNATIONAL SEARCH REPORT

PCT/US03/17788

## Continuation of Box I Reason 2:

The subject matter claimed in claims 22 and 24 is not adequately supported by the description such that the scope or meaning of the limitations is clear; and one of ordinary skill in the art would not be enabled to make and or use the invention.

## BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-5, drawn to a method for enhancing transmitted audio data, comprising digital coding, pre-emphasis, transmission, decoding, and de-emphasis.

Group II, claim(s) 6-11, 15-18, and 27-32, drawn to a method and corresponding apparatus for distinctly processing a received audio signal in multiple bands, combining the processed bands, and applying further processing to the combined audio signal.

Group III, claim(s) 12-14, drawn to a method for correcting the acoustic response of a listening environment by measuring the impulse response of the environment and deriving and employing a corresponding compensatory process.

Group IV, claim(s) 19-34, drawn to a method and corresponding apparatus for creating a difference in dynamics among sound streams and adding predictable environmental characteristics.

The inventions listed as Groups I-IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature (the contribution the invention, considered as a whole, makes over the prior art) of the inventions listed as Group I, digital audio coding, pre-emphasis, transmission, decoding, and de-emphasis to minimize distortions, is not shared by any of the other groups.

The special technical feature of the inventions listed as Group II, multi-band processing of a received audio signal, recombination, and applying subsequent processing, is not shared by any of the other groups.

The special technical feature of the inventions listed as Group III, correcting the acoustic response of a listening environment by measuring the impulse response of a listening environment and applying corresponding compensation, is not shared by any of the other groups.

The special technical feature of the inventions listed as Group IV, creating a difference in dynamics of sound streams and adding predictable environmental characteristics, is not shared by any of the other groups.

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US03/17788

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claim Nos.: 22 and 24  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
Please See Continuation Sheet
3. ☐ Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐  
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.